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(54) Title: <b>MAT, MORE SPECIFICALLY A MAT FOR LYING ON</b>			
(57) Abstract			
<p>The invention concerns a mat, more specifically a mat for lying on, characterised in that said mat essentially comprises a three-dimensional fabric or knitted structure with a top layer (1) and a bottom layer (2) connected by a middle layer (3), where the top layer (1) is permeable to moisture and air and the middle layer (3) is permeable to air in such a way that an airflow is possible through said middle layer parallel to the top and bottom layers.</p>			

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Mat, more specifically a mat for lying on

The invention concerns a mat, more specifically a mat for lying on, which for example is to be laid on top of a mattress or on a hard surface, such as a floor, with an air-permeable top layer and a bottom layer facing it, separated from each other by a middle layer with an open structure.

According to the invention, the aim is among other things to propose a mat which makes it possible to prevent overheating of those parts of the body in contact with the mat, in particular during hot weather, and more specifically in the case of bed-ridden persons and babies.

Further, the invention also aims to propose a mat which makes it possible to considerably reduce the risk of suffocation or cot death in babies.

To this end, the mat according to the invention comprises a three-dimensional knitted structure, with a middle layer essentially formed by open, relatively rigid threads, more specifically monofilaments, where said threads form part of said three-dimensional knitted structure, and where said threads, more or less evenly distributed, are placed at a certain distance from each other, such that a) said middle layer is more or less incompressible under the weight of a person lying on the top layer, and b) a permanent flow of air is possible between said middle layer and the top layer.

The top and bottom layers are purposefully parallel to each other, and at least 70% of the monofilaments in the middle layer extend more or less perpendicularly to said top and bottom layers, with the remaining portion of the monofilaments being crossed over each other and distributed over the middle layer, in order to prevent said perpendicular monofilaments from

turning over or bending under the weight of a person lying on top of the mat.

In an advantageous embodiment of the invention, at least the above-mentioned top layer consists of a knitted structure with meshes having a cross-section of 0.5 mm to 10 mm, and preferably a cross-section of between 2 and 4 mm.

Other features and advantages of the invention will be apparent from the following description of some specific embodiments of a mat for lying on according to the invention; this description is given by way of example and in no way limits the scope of the protection afforded. The reference numbers used below relate to the accompanying drawings.

Fig. 1 is a schematic perspective view of part of a mat for lying on according to a first embodiment of the invention.

Fig. 2 represents a schematic cross-section of part of a mat for lying on according to a second embodiment of the invention.

Fig. 3, on a greater scale, is a schematic perspective view of part of a mat for lying on according to a third embodiment of the invention.

Fig. 4, on an even greater scale, is a schematic detail representation of a special component of the mat according to fig. 3.

In these drawings, the same reference numbers refer to identical or analogous elements.

The mat for lying on presented in the drawings essentially comprises a three-dimensional knitted structure ("Abstandsgewirke" - "face-to-face fabric") with a top layer 1 and a bottom layer 2 separated from each other by a middle layer 3.

At least the top layer 1 and the middle layer 3 are permeable to air, such that an air flow can arise

through the top layer 1 and the middle layer 3, more specifically from the middle layer 3 through the top layer 1. In the middle layer 3, the air flow can occur over the entire mat, in all directions. The continuous ventilation thus generated also ensures that the person lying on top of the mat does not suffer from perspiration.

A baby lying with its face on the mat will always receive a sufficient supply of air through the middle layer 3 and the top layer 1 of the mat, so that the risk of suffocation is virtually excluded and furthermore better temperature regulation is possible.

In the middle layer 3 in particular, the amount of free space is very great in comparison to the material from which said layer is formed, and its volume is preferably at least five times the volume of said material.

In the specific embodiment as represented in fig. 1, the middle layer 3 comprises upright threads 4 woven into those of the top layer 1 and the bottom layer 2. These extend obliquely with respect to the top and bottom layers 1 and 2 which are parallel to each other; said upright threads make the same angle when crossing each other or the two layers, in order to give the middle layer sufficient springiness in a direction perpendicular to it, and at the same to give the required rigidity to ensure that said middle layer is not compressed under the weight of the person lying on top of the mat, thus maintaining the above-mentioned airflow.

To this end, said threads 4 consist for example of relatively rigid monofilaments, preferably with a diameter in the order of 0.01 mm to 0.5 mm, more specifically between 0.09 mm and 0.21 mm.

The middle layer 3 can mostly have a thickness of between 0.1 cm and 1 cm, but preferably between 0.3

and 0.6 cm, for example 0.45 cm.

The top layer 1 consists of an open fabric or knitted structure with sufficiently large meshes 5, which ensure the through-flow of air. These preferably have a diameter between 0.5 mm and 10 mm, more specifically between 2 and 4 mm.

The bottom layer 2 is preferably impermeable to moisture. This is particularly important if the mat for lying on is used on a damp surface or as a mattress protector. To this end, the bottom layer 2 can for example consist of a densely woven or knitted structure, on to which a film of plastic or aluminium can be laminated or glued.

The embodiment shown in fig. 2 differs from that in fig. 1 in that the middle layer 3 consists of relatively thick, rigid, upright monofilaments 4, which are not crossed and extend more or less perpendicularly to the top and bottom layers 1 and 2.

Further, the bottom layer 2 consists of a moisture-absorbing material, to the outside of which is glued a plastic film 6 which ensures that the bottom of the mat for lying on is moisture-proof.

In the preferred embodiments according to figs. 1 and 2, the middle layer 3 consists of synthetic monofilaments 4, such as polyester with a diameter of 0.08 mm, while the top layer 1 consists essentially of cotton (detex 100/1) and the bottom layer 2 consists of a polyester fabric (detex 110).

Figs. 3 and 4 relate more specifically to a special embodiment of the three-dimensional knitted structure which according to the invention forms the main part of the mat.

As can be seen, both the top layer 1 and the bottom layer 2 are formed by a very open meshwork, whose meshes 5 are hexagonal.

Further, the meshes 5 of both layers are directly opposite each other, and the corresponding sides of said meshes are connected with each other by monofilaments 4, of which at least 70% and preferably at least 90% extend perpendicularly to the two layers 1 and 2 and determine the middle layer 3. The remaining monofilaments are crossed over each other and are evenly distributed over the whole volume of the middle layer 3.

For the sake of clarity, said remaining monofilaments are indicated in fig. 3 by reference number 4'.

As can be clearly seen on this figure, said oblique crossed monofilaments 4' connect one side 1a of each of the meshes 5 of the top layer 1 with a side 2b of the bottom layer 2 located under the side 1b of the top layer lying opposite, and conversely connect the side 1b of the top layer 1 with the side 2a of the bottom layer 2.

In this way, the upright monofilaments 4 are prevented from bending or turning over under the weight of a person lying on top of it, thus making the mat more or less incompressible under such a weight.

Furthermore, in order to obtain a stable whole, the monofilaments 4 and 4' form part of the three-dimensional knitted structure itself, and are in a way woven into the sides of the layers 1 and 2 which delimit the meshes 5. In this way the three layers 1, 2 and 3 are formed in a single knitting pass.

Also, the sections of the monofilaments 4 and 4' which are woven into the top and bottom layers 1 and 2 are completely sunk into said layers, such that the outsides of both these layers are nearly completely smooth.

This is illustrated in fig. 4, which is a schematic representation of part of a side of one of the

meshes of the top layer 1 and of part of the corresponding side underneath it in the bottom layer 2.

Further, at least the top layer 1 consists essentially of microfilaments which themselves are known. For the sake of clarity, however, these microfilaments are not shown in fig. 4.

In the embodiment according to figs. 3 and 4, the three-dimensional knitted structure corresponds to the following specifications:

- top layer 1: microfilaments of polyester dtex 110f 128 x 3; "jet-tex" (trademark of Hoechst)
- middle layer 3: monofilaments of polyester with diameter of 0.16 mm
- bottom layer 2: polyester dtex 167 f 32 x 1.

In some cases, means may be easily provided to obtain a forced air flow through the top layer 1 via the middle layer 3. This can be done for example by connecting a dismountable fan on one of the edges of the mat by means of a suitable nozzle which extends over the full length of the side and is attached to it by means of a clamp system without compressing the mat.

In addition to the above-mentioned advantages, the mat according to the invention has the further advantage that it is easy to wash, due in particular to the more or less continuous free space of the middle layer 3.

Further, this mat remains free of house mites, thanks to the above-mentioned continuous flow of air in the middle layer 3, the relatively low temperature which is maintained and the absence of perspiration moisture, making it ideal for people who are allergic to these mites.

Further, the three-dimensional knitted structure shown in fig. 3 is very easy to see through, thanks to the meshes lying opposite each other in the top

and bottom layers, making it easy to check the permeability to air.

These different types of three-dimensional knitted structure can be manufactured by the "Karl Mayer" company using a machine of the type "RD-6".

The invention is of course in no way limited to the embodiments described above and shown in the accompanying drawings; other variants can be considered as regards the choice of material used for the knitted structure and the dimensions of same.

Further, the mat can for example form part of the top of a mattress, being removably attached to the mattress. The thickness and rigidity of the mat can also be varied in function of the weight of the person lying on top of it.

On at least one of the layers 1 or 2, but preferably on the top layer 1, an extra molton layer may be provided, such that the air-permeability of the top layer is scarcely affected.

Finally, the invention is not limited to a mat for lying on but can be applied wherever there are problems of cooling, air permeability, oxygen supply, etc., such as for horse blankets or saddle cloths.

CLAIMS

1. Mat, more specifically a mat for lying on, with a top layer (1) which is permeable to air and with a bottom layer (2) facing it, said layers being separated from each other by a middle layer (3) with an open structure, characterised in that said mat essentially comprises a three-dimensional knitted structure, whose middle layer (3) is essentially formed by upright, relatively rigid threads, more specifically monofilaments (4) and (4') which form part of said three-dimensional knitted structure and which extend at a certain distance from each other, more or less evenly distributed, such that firstly said middle layer (3) is nearly incompressible under the weight of a person lying on the top layer (1), and secondly a permanent flow of air is possible through said middle layer (3) and top layer (1).

2. Mat according to claim 1, characterised in that the top layer (1) and the bottom layer (2) are parallel to each other and that at least 70% of the monofilaments (4) in the middle layer (3) extend more or less perpendicularly to said top layer (1) and bottom layer (2), with the remaining portion of the monofilaments (4') being crossed over each other and distributed over the middle layer, in order to prevent said perpendicular monofilaments (4) from turning over or bending under the weight of a person lying on top of the mat.

3. Mat according to claim 1 or 2, characterised in that the volume of free space in the middle layer (3) is at least five times the volume of the monofilaments (4) and (4').

4. Mat according to one of claims 1 to 3, characterised in that the monofilaments (4) and (4') have a diameter of between 0.01 mm and 0.5 mm, and preferably

between 0.09 mm and 0.21 mm.

5. Mat according to one of claims 1 to 4, characterised in that said middle layer (3) has a thickness of between 0.1 cm and 1 cm, and preferably between 0.3 cm and 0.6 cm.

6. Mat according to one of claims 1 to 5, characterised in that at least said top layer (1) consists of a knitted structure with meshes (5) of 0.5 mm to 10 mm in cross-section and preferably between 2 and 4 mm cross-section.

7. Mat according to one of claims 1 to 6, characterised in that the portion of the monofilaments that form part of the top layer (1) and bottom layer (2) are sunk into said layers.

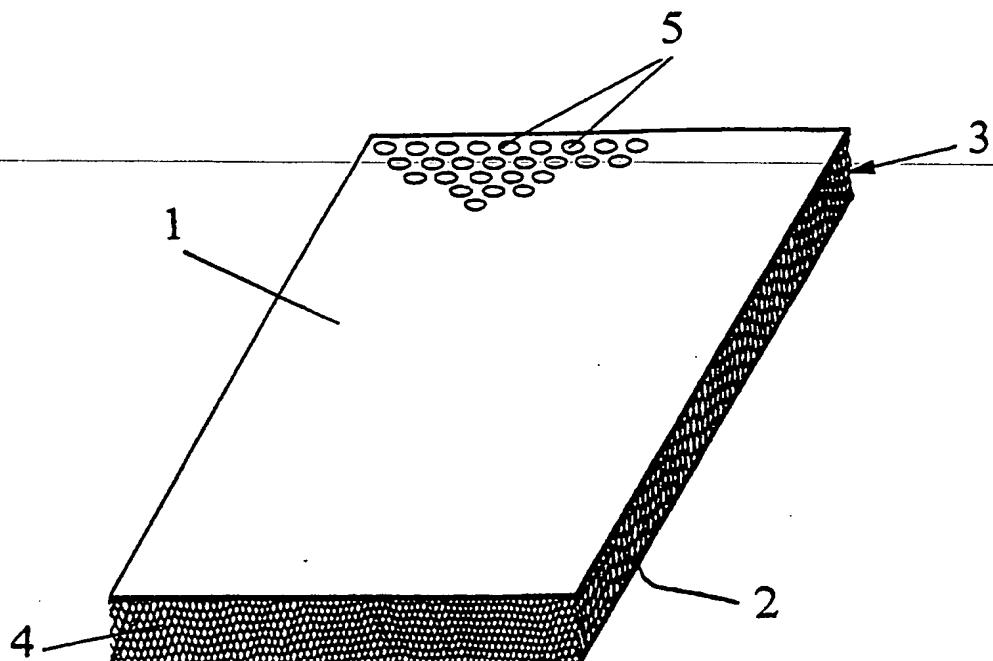
8. Mat according to one of claims 1 to 7, characterised in that at least the top layer (1) consists essentially of microfilaments.

9. Mat according to one of claims 1 to 8, characterised in that a molton layer is provided on at least one of the mat's outside surfaces.

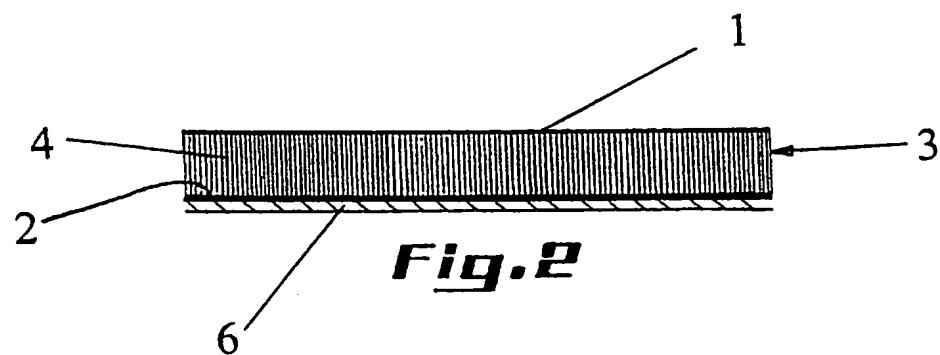
10. Mat according to one of claims 1 to 9, characterised in that a moisture-proof film (6) is applied to the bottom.

11. Mat according to one of claims 1 to 10, characterised in that it forms part of a mattress and is attached to same in a removable manner.

12. Mat according to one of claims 1 to 11, characterised in that means are provided for creating a forced air flow through the top layer (1) via the middle layer (3).



**Fig.1**



**Fig.2**

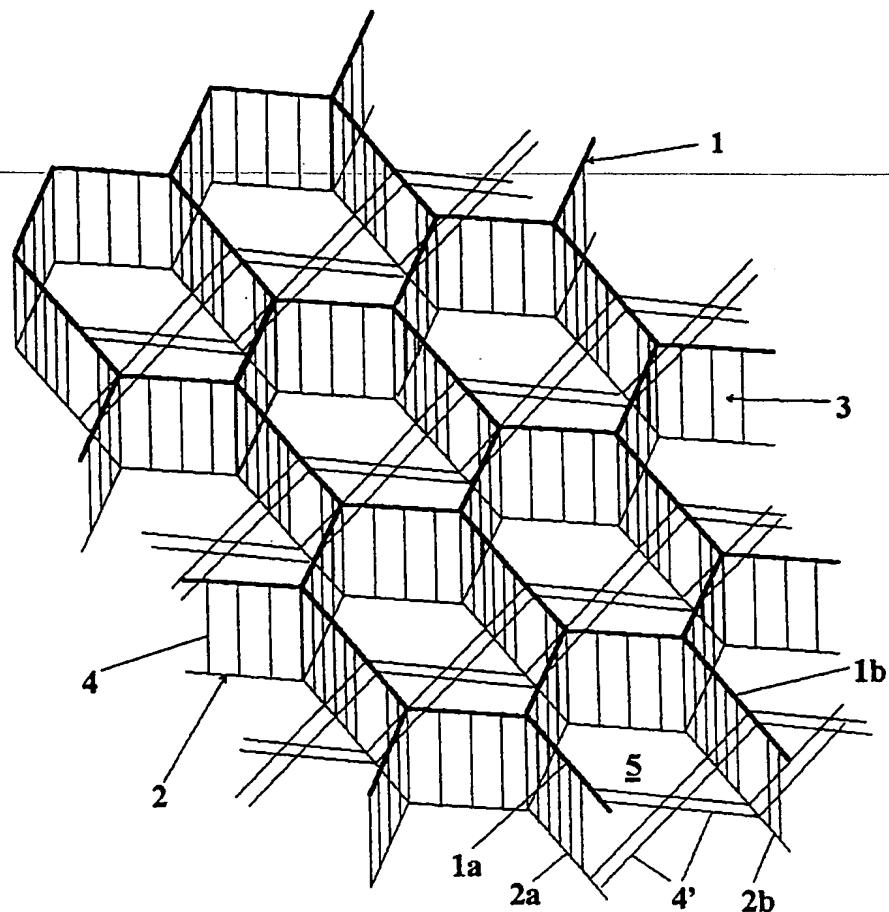


FIG. 3

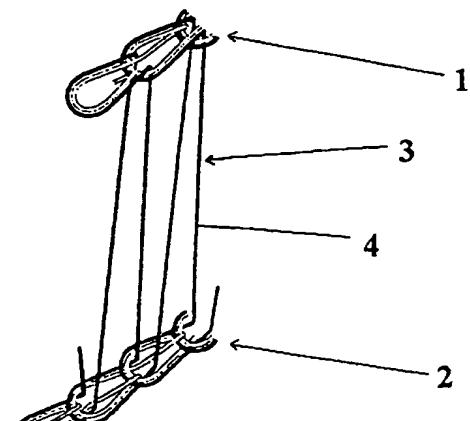


FIG. 4

## INTERNATIONAL SEARCH REPORT

Int:  Application No  
PCT/BE 95/00066A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A61F5/48 A61G7/057

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## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61F A61G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,41 11 743 (FORSCHUNGSSINSTITUT FÜR TEXTILTECHNOLOGIE CHEMNITZ GMBH) 8 October 1992 see the whole document ---	1-12
A	EP,A,0 261 904 (STANDARD TEXTILE COMPANY INC.) 30 March 1988 see column 3, line 7 - line 25; figures ---	1-12
A	US,A,4 695 496 (LEE) 22 September 1987 see column 6, line 1 - line 13; figure 5 ---	1-12
A	CH,A,455 142 (PFISTER) 28 June 1968 see column 2, line 19 - line 22; figures ---	1-12
A	DE,U,91 12 275 (ZIEGLER) 16 January 1992 see page 4, line 21 - line 30 ---	1-12
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Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 691 570 (GAINES ET AL.) 19 September 1972 ---	
A	FR,A,2 616 320 (CHERENCE) 16 December 1988 ---	

INTERNATIONAL SEARCH REPORT

Int'l Application No  
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-4111743	08-10-92	NONE		
EP-A-0261904	30-03-88	US-A-	4961982	09-10-90
US-A-4695496	22-09-87	NONE		
CH-A-455142		NONE		
DE-U-9112275	16-01-92	NONE		
US-A-3691570	19-09-72	NONE		
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